

On the avifauna of Australia*

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I am here offering a preliminary account of some points about the Australian avifauna which interest me, particularly against the background of the Ethiopian and western Palaearctic avifaunas.

This has been made possible thanks to the fact that the Australian Academy of Sciences awarded me a Senior Scholarship which enabled me to visit the continent in 1963, and the Division of Wildlife Research gave me further generous assistance. I am glad to have this further opportunity of acknowledging my indebtedness not only to these bodies but also to the many individuals who helped and instructed me. Among them I must mention especially Claude Austin, Dr. H. J. Frith, Michael Ridpath and Dr. D. L. Serventy; and I am indebted to Dr. Serventy and Dr. S. J. J. P. Davies for criticizing the draft of these notes. A further paper on the avifauna of Tasmania (by Ridpath and Moreau) has been accepted for publication in *Ibis*.

Australia has an area of about 3,000,000 square miles, almost the same as the U.S.A. and as Europe. During the last glaciation, when the locking-up of water in the ice-caps lowered the sea-level by some 300 ft., both New Guinea on the north and Tasmania on the south were connected with the continent. It can be calculated that these connections would not have been broken until much later, about 12,000 years ago with Tasmania; 7,000 with New Guinea.

In its surface relief Australia is much the most uninteresting of the continents; half the entire area is within 1000 ft. of sea-level and nearly all the remainder within 2,000 ft. The only areas much above 3,000 ft. are in the extreme south-east and there has thus been little opportunity for any montane avifauna to develop.

The northernmost tip of the continent, Cape York, is at 10° S., the southernmost at 39° S., nearly two thirds of the surface of the continent being outside the tropics. An equivalent span of latitude north of the equator would be from Sierra Leone to north of Andalusia and climatically there is a close parallel, for both spans include a great high-pressure belt which gives rise to desert and semi-desert conditions. In fact by far the greater part of the continent receives less than 20 inches of rain a year and much of it less than 10 inches; higher rainfall is confined to a strip round the northern, eastern and south-eastern perimeter, with a small isolated patch at the south-western tip. These low annual averages do not, however, by any means tell the full story of Australia's climatic rigours. As elsewhere in the world, unreliability of rainfall increases as the annual average decreases, but in Australia the unreliability at every level is 10% higher than elsewhere (Leeper, 1960). As an extreme example, in places in New South Wales where in 1956 "sheep drowned in flood-water two feet deep, in the same paddocks at the same time of the year in 1957 the survivors died from starvation and lack of water" (Frith, 1962). This feature of the Australian climate is reflected in the bird life of Australia in three ways, namely, (1) a high degree of nomadism—most conspicuously

* At the meeting held on 17th November, 1964, Mr. Moreau spoke on this subject.

perhaps in the ducks, (2) great fluctuations in numbers, (3) adaptation to irregular, opportunist breeding. This last has been well illustrated by Serventy & Marshall (1957). They showed that when heavy rain fell in south-western Australia out of season, 39 species of birds promptly nested, at a time of year when they would not normally have done so; and the response was greatest in that part of the area affected which has the lowest average annual precipitation. Of the other aspects the expedition through the west centre of Australia, from Perth and Kalgoorlie to Alice Springs, which I accompanied in July 1963, gave a good example. Although most of the continent had been having exceptionally good rains, along many hundreds of miles of our route the severe drought of past years had not broken, and we saw no Emus, only one party of Budgerigars, and less than a score of Columbidae, though much of the country we traversed would normally be suitable for them.

As in other parts of the world, the climate of Australia has been subject to considerable fluctuations, but there is little detailed evidence of any kind except for the southernmost quarter of the continent (see especially the comprehensive review by Gentilli, 1961). So far as the Late Pleistocene is concerned, it can be said with certainty that there was a period when the climate was more humid than it is at present and another when it was more arid. The evidence for the first is mainly biological. At present the humid south-west corner of Western Australia is separated from the east by over 1000 miles of arid and largely treeless country. Yet with the exception of a single species, the parrot *Purpureicephalus spurius*, all the woodland birds inhabiting this humid "island" have close relatives in south-eastern Australia (see especially Serventy 1953, Serventy & Whittell, 1962). Still more cogent evidence is provided by so immobile an animal as the Koala *Phascolarctus cinereus*, dependent on certain species of *Eucalyptus* and now confined to eastern Australia, but found fossil in the south-west corner in the same caves as the remains of two important marsupial predators, the Tasmanian Devil *Sarcophilus harrisii* and the Tasmanian Wolf *Thylacinus cynocephalus*. All these three mammals had ceased to exist in the south-west corner before European man appeared. What caused their local extinction? If it was drought, a great wealth of endemic plants nevertheless survived, yet there is evidence of a dry period that affected certainly the Lake Eyre neighbourhood, and eliminated several giant marsupial species, as recently as 4,000–6,000 years ago (Gentilli, 1961). Moreover, something like half a million square miles of the southern and western interior of Australia are covered with sand-dunes that are now fixed by vegetation, albeit in places, it appears, only precariously. Hence there is a variety of evidence for at least the south-western half of the continent that the bird habitats have been subject to great vicissitudes in the last few thousand years.

Compared with the rest of the world the vegetation of Australia is very odd. The woody plants are practically all evergreen but a large proportion of them are perpetually shedding their bark, which flakes off or hangs in long, loose strips. Two groups, *Eucalyptus* with about 600 species and *Acacia* with 400, are dominant. In the absence of human interference, trees of these genera are extremely abundant over much of Australia. In a journey through the very dry country from Kalgoorlie to Alice Springs

I was struck by the fact that we were practically never out of sight of trees and for long stretches were travelling through woods of Mulga *Acacia aneura*. For most birds except honey-eaters (Meliphagidae) neither eucalyptus nor acacia trees are directly an important source of food. Plants bearing fruit with a soft pericarp or berries edible by birds are remarkably restricted, being abundant only in the tropical north-east, a fact immediately reflected in the distribution of fruit-eating birds. By contrast, the south-western half of the continent is almost wholly devoid of such fruit, as kindly verified for me by Serventy (*in litt.*). The fruits of *Eucalyptus* spp. are in hard woody capsules and those of *Acacia* spp. more or less like pea-pods, but the seeds contained in the latter seem to be eaten only by some parrots and pigeons. Another peculiarity of the vegetation is that the grass-seed is remarkably small and light. It has in fact been well said that the dice were indeed loaded against the Australian aboriginal, for the continent provided him with no animal worth domesticating and no plant worth cultivating.

Notwithstanding his limited culture, aboriginal man must have had an important influence on the vegetation through his use of fire to assist him in hunting. Moreover recent research has put back the date of his advent to Australia to 18,000 years ago (E. D. Gill, 1961) and perhaps even 25,000 (Tindale & Lindsay, 1963). The Dingo came much later; it has not been proved to occur on the continent more than about 6,000 years ago, presumably introduced by man, but thereafter it has no doubt had an adverse effect on ground-nesting birds. However, in some other aspects of the Australian environment the birds have been exceptionally fortunate; there was of course no squirrel nor monkey and no comparable predator, and there was no malaria. Another feature of the biological environment, in which Australia differs from the other southern continents, is that there is hardly any seasonal incursion of Palaearctic migrant land-birds; apart from waders, the only species that come in any numbers to pass the northern winter are two swifts.

European man has of course had a powerful effect on the vegetation. On the one hand over-grazing has led to grave deterioration of the vegetation over vast areas. Then, a great deal of woodland has been cleared for dairying enterprises (which rely on the establishment of imported grasses, since the nutritive value of the native species is so poor), for wheat cultivation (which has led to wholesale devastation of the Mallee, the exclusive habitat of that interesting megapode the Mallee Fowl *Leipoa ocellata*, monographed by Frith (1962)) or for other cultures, including orchard crops. Such changes are greatly to the detriment of most native birds, but there are certain compensations. One is that the extension of stock-keeping throughout most of the arid interior has led to a multiplication of dams and reservoirs fed by boreholes and these water-points allow some of the parrots and other birds to maintain themselves in places and during dry seasons where otherwise they could not. Also, while destruction of the trees catastrophically reduces the nesting-sites for birds requiring holes, in some localities, such as I saw in western Victoria, the present combination of circumstances is peculiarly favourable for a few species. Many old trees are left standing—though their days are numbered and there is no regeneration—while the pickings from the wheat farms provide an unprecedented

supply of food, especially for Galahs *Kakatoe roseicapilla* and Sulphur-crested Cockatoos which can be seen abundantly round railway sidings. An unexpected new source of food has been provided by the "onion weed" pest of grain fields, a *Romulea* accidentally introduced from South Africa, the bulb of which is dug up by Galahs and Long-billed Corellas *Kakatoe tenuirostris* with great enthusiasm. Other beneficiaries among native birds are the Shelducks *Tadorna tadornoides*, which enjoy the green crops, and the crows *Corvus* spp., "magpies" *Gymnorhina* spp. and pipits *Anthus novaeseelandiae* which abound in cultivated pasture, probably far more than they ever did on any natural vegetation. It may be added that the Magpie Goose *Anseranas semipalmata* takes to rice cultivation so keenly that the bird may not be allowed to survive.

Excluding sea-birds and using the polytypic concept thoroughly, Keast (1961) arrived at a total of 531 species of birds breeding in Australia with Tasmania. More than one third of the entire avifauna is made up of only three families—50 parrots (Psittacidae), 64 warblers (Sylviidae), 67 honey-eaters (Meliphagidae). For an area of 3,000,000 sq. miles, with a range of habitat from desert to tropical rain-forest, 531 species is not an impressive total; for example, it is about the same as that of New Guinea, which has one-tenth the area, and less than that of Kenya, which has only one-twelfth. It is possible that the climatic vicissitudes of the Late Pleistocene have led to a higher proportion of extinctions than in the other areas. One spectacular casualty at least is known to have occurred, for it has recently been discovered (Miller, 1962) that after a long history in Australia flamingos (Phoenicopteridae) ceased to exist there late in the Pleistocene, perhaps eliminated by the "Great Arid" around 5,000 years ago.

From the ecological point of view the Australian avifauna presents a number of peculiarities, of which I find the following the most noteworthy.

(1) Scavenging birds are poorly represented in the avifauna; only the Wedge-tailed Eagle *Aquila audax* and the Whistling Eagle *Haliastur sphenurus* being much dependent on carrion, while the kite *Milvus migrans* and the crows (*Corvus* spp.) are, as elsewhere, pickers-up of unconsidered trifles. There is no equivalent of vultures or of the Marabou Stork *Leptoptilos*, omissions difficult to understand in view of the wealth of large marsupials.

(2) Aerial-feeding birds seem unaccountably few. There is no resident species of swift (Apodidae), though two from the north spend their off-season in Australia; and there are only four hirundines in the entire continent. There are, however, six wood swallows *Artamus* spp., one or more of which, foraging high, may to some extent take the place of swifts. There is one species of bee-eater, but only one.

(3) There is much migration northwards by non-breeding birds in the winter half of the year but it seems very incomplete. I was surprised to find, around the shortest day, the local swallow *Hirundo tahitica neoxena*, which is a close relative of *H. rustica*, numerous right down at Cape Leeuwin, the south-western limit of the continent, and also south of Perth a *Cuculus pallidus* feeding what was presumably its mate. And only a month later a Fantailed Cuckoo *Cacomantis pyrrhophanus* was present and calling on Philip Island near Melbourne. Such observations would not

be possible in a corresponding latitude in the Mediterranean basin, and even in Cape Province of South Africa, at exactly the Australian latitudes, the several swallow species and practically all the various parasitic cuckoos depart for the winter. The difference suggests that the winter supply of insects in the better-watered areas of southern Australia must be comparatively good.

(4) There is no woodpecker and a variety of birds to some extent fill the niche. The "heaviest" work in this connection is done by the big black cockatoos *Calyptorhynchus* spp., which bite clumsily and deeply into tree trunks. The so-called "tree creepers" *Climacteris*, of which there are several species with interesting interrelations, are specialists at tearing at and probing the abundant loose bark. This is explored also to some extent by other birds, for example, the currawongs *Strepera* spp., the shrike-tit *Falcunculus frontatus* and the nuthatch-like *Neositta chrysoptera*. It does, however, appear that no Australian bird is adapted to bore neatly and efficiently into tree-trunks; nor is any local bird equipped with a long probing beak such as is possessed by the wood hoopoes (Phoeniculidae) of Africa and has been developed—a beautiful example of convergence—by the passerine *Falcula* of Madagascar. Big grubs, such as the famous witchitty, the "bardee" of Western Australia, a favourite food of aboriginal man, certainly abound in Australian trees. It would be interesting to know whether in fact any important source of food, deep enough in the wood to be immune from all but the clumsy operations of the cockatoos, is being neglected.

(5) Insectivorous birds that feed by night seem remarkably sparse in Australia by the standards of other countries. They appear to be limited to two owls, one owlet-nightjar *Aegotheles* and three nightjars *Caprimulgus*, one of which hardly counts for the present purpose, since it is confined to the tip of the Cape York peninsula. Moreover I understand that nowhere except perhaps in the tropical north-east are large numbers of nocturnal birds encountered, either in the air or sitting on the roads, when one is driving with headlights, as they would be encountered in Africa. In addition to the birds cited, Australia possesses three species of frogmouth *Podargus*, which would naturally be supposed to come into this category and from the nature of their enormous mouths, to be aerial feeders no less than the nightjars. In fact there is no positive evidence that they are so (*cf.* B. E. Smythies *in litt.* for Asiatic birds), while Serventy has observed *P. strigoides* picking up food from the ground and has found mouse, scorpion, centipede and snail in stomachs. This raises an interesting evolutionary question; in its anatomy *Podargus* appears highly specialized for aerial feeding. Are appearances deceptive or has there for some reason been a change in the feeding habits of the whole group?

(6) The ecological niches occupied by larks and pipits, richly represented by many different species in much of the Old World, would seem to offer great opportunities throughout the vast open areas of Australia, but few species fill them. The only lark, *Mirafra javanica*, which extends across the Oriental and Ethiopian regions, is in Australia confined to the periphery and is absent from extra-tropical Western Australia. The sole pipit, *Anthus novaeseelandiae*, which has a world range even greater than the *Mirafra*, has shown itself extremely adaptable in Australia, for it occurs in

open country of every kind, including cultivation, even locally in the dry interior and on the moorlands above the timber-line on the mountains of the south-east. Two endemic birds which should perhaps be regarded as to some extent occupying lark-pipit niches are the "song larks" *Cinchorhamphus*, which are placed in the Sylviidae.

(7) The parrot family, with its 50 species, all but six endemics, shows an interesting radiation. The cockatoos, the biggest species, with the most powerful beaks, tackle seeds and hard fruits, while some also dig up bulbs and corms and others bite deeply into trees for grubs. There seems to be only one species of parrot that is primarily a fruit eater, dependent on figs in the tropical forest of north-east Queensland. But several species, with specialized brush tongues, are more or less dependent on nectar and hence of the local and specific flowering of eucalyptus trees. All the remaining parrot species, that is, the great majority, are primarily or exclusively seed-eaters, but from published accounts it is not at all clear what use they make of the seeds of either of the dominant genera of Australian trees, *Acacia* and *Eucalyptus*. Only the utilization of the Marri fruit, *Eucalyptus calophylla*, has been studied by Robinson (1960); the Twenty-eight Parrot, *Barnardius zonarius*, eats it when it is soft and immature and the King or Red-capped Parrot, *Purpureicephalus spurius*, later, when the seeds have developed.

(8) Other seed-eating birds are by no means numerous in the Australian avifauna, presumably because this niche is so well filled by the parrots. There is no finch, no bunting and no native ploceid weaver. There are indeed 18 estrildine weavers, but they are so strongly concentrated in the tropical part of the continent that only two are resident in the southern part of Western Australia, where native grasses are particularly scarce, and three in South Australia.

(9) Especially to anyone used to the ubiquity and abundance of the Columbidae in Africa, the status of this family in Australia is remarkable. The fact that in nearly 1,000 miles of interior Australia, from Kalgoorlie to Alice Springs in July 1963, less than a score of Columbidae of any sort were recorded impressed me greatly. Much of the distance was certainly drought-stricken, but by no means all. In fact, of the 22 species in the continent, no less than ten are birds of the tropical rain-forests and eight of these are fruit-eaters. Another ten species are birds of northern and inland Australia and two of these are restricted to the vicinity of rocky outcrops. Only two species, Bronzewings (*Phaps*), appear to range naturally to the south coast and in this southernmost part of the continent they do not form a numerous or conspicuous element of the avifauna.

(10) In conformity with the paucity and the geographical limitation of native fruits and berries, birds dependent wholly or mainly on fruit are restricted to the tropical north-east and, to a lesser extent, to the north-west. Taxonomically also they are remarkably restricted, for such species are found only among the Columbidae (8 species), the Oriolidae (mainly the two "fig birds"—*Sphecotheres*), one or two parrots and a single starling (Sturnidae; *Aplonis*), which only just enters the Cape York peninsula from New Guinea. There is no local equivalent to the Capitonidae (barbets), Bucerotidae (hornbills), Musophagidae (turacos) and no proliferation of starling species such as is so notable a feature in Africa.

It is worth drawing attention to the fact that although Australia is no such focus of primitive types in the Aves as it is in the Mammalia, it possesses three groups of birds with extraordinary biology, for which there is no parallel in other continents. The first two appear also in islands to the north.

- (a) The bower birds (Ptilonorhynchidae), with their unique "architectural" and "artistic" ability, monographed by Marshall (1954).
- (b) The mound-builders (Megapodidae), among which the Mallee Fowl has been specially studied by Frith (1962). From the ecological point of view it is of interest that, while mostly confined to the scrubby woodland in which Mallee *Eucalyptus dumosa* is an extremely strong dominant there, this bird is for months almost entirely dependent for food on the seeds of the acacias and cassias which form only one tenth of the woodland community.
- (c) The lyrebirds (Menuridae), which though classed as sub-oscine on the grounds of their relatively simple throat musculature, have among the most superb and flexible vocal powers of any birds in the world. They are being adequately studied for the first time by the Division of Wildlife Research in mountain forest near Canberra, where distance-recording instruments of various kinds are being used to obtain continuous data on an exceedingly shy population. By contrast, the lyrebirds of the Dandenong forests, on the edge of the Melbourne suburbs, have become habituated to close human scrutiny to an extent that must be seen to be believed.

Features of lyrebird biology which are unusual are that they breed in mid-winter, when in some of their localities frost occurs, lay only a single egg, and at all stages of incubation leave it uncovered for long periods so that its temperature falls to that of the surrounding air. Among passerines the lyrebird may be unique in such resistance of the embryo to chilling.

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